WHAT IS CLAIMED IS:

1. A substantially pure polypeptide comprising an amino acid sequence that is identical to a wild type IL-7 sequence except that one or more amino acid residues in the carboxy-terminal helix D region is mutant.

2. The polypeptide of claim 1, wherein the polypeptide comprises a mutation in the region corresponding to amino acid positions 136-144 of SEQ ID NO:1 or in a corresponding region of an IL-7 polypeptide from another species.

3. The polypeptide of claim 2, wherein the mutation comprises a deletion of one or more of the amino acids corresponding to positions 136-144 of SEQ ID NO:1 or from a corresponding region of an IL-7 polypeptide from a non-human species.

4. The polypeptide of claim 2, wherein the mutation comprises an addition of one or more amino acids corresponding to positions 136-144 of SEQ ID NO:1 or to a corresponding region of an IL-7 polypeptide from a non-human species.

5. The polypeptide of claim 2, wherein the mutation comprises a substitution of one or more of the amino acids corresponding to positions 136-144 of SEQ ID NO:1 or in a corresponding region of an IL-7 polypeptide from a non-human species.

6. The polypeptide of claim 5, wherein the substitution comprises a non-conservative substitution.

7. The polypeptide of claim 5, wherein the substitution comprises substituting a non-aromatic amino acid in place of an aromatic amino acid.

8. The polypeptide of claim 2, wherein the mutation comprises a mutation at the position corresponding to position 143 of SEQ ID NO:1.

9. The polypeptide of claim 8, wherein the mutation comprises a substitution of the amino acid corresponding to position 143 of SEQ ID NO:1 with alanine or proline.

10. The polypeptide of claim 8, wherein the mutation comprises a substitution of the amino acid corresponding to position 143 of SEQ ID NO:1 with histidine or tyrosine.

11. The polypeptide of claim 5, wherein the substitution comprises a conservative substitution.

12. An isolated nucleic acid molecule comprising a sequence encoding a polypeptide of claim 1.

13. An expression vector comprising the nucleic acid molecule of claim 12.

14. The expression vector of claim 13, further comprising a sequence that encodes a detectable marker.

15. The expression vector of claim 14, wherein the detectable marker is a green fluorescent protein, β-galactosidase, or chloramphenicol acetyl transferase.

16. The expression vector of claim 14, wherein the detectable marker is an epitope tag.

17. A cell comprising the polypeptide of claim 1.

18. A cell comprising the nucleic acid molecule of claim 12.

19. A cell comprising the expression vector of claim 13.

20. An antibody that specifically binds the polypeptide of claim 1.

21. A method of treating a patient who has a T cell-mediated disorder, the method comprising administering to a patient a composition comprising a polypeptide of claim 1, and wherein the amount of the composition administered is sufficient to inhibit the symptoms of the T cell-mediated disorder in the patient.

22. A method of treating a patient who has a T cell-mediated disorder, the method comprising administering to a patient a composition comprising the nucleic acid molecule of claim 12, and wherein the amount of the composition administered is sufficient to inhibit the symptoms of the T cell-mediated disorder in the patient.

23. A method of treating a patient who has a T cell-mediated disorder, the method comprising administering to a patient a composition comprising the expression vector of claim 13, the amount of the composition administered being sufficient to inhibit the symptoms of the T cell-mediated disorder in the patient.

24. The method of claim 21, wherein the T-cell-mediated disorder is a cancer.

25. The method of claim 21, wherein the T-cell-mediated disorder is an autoimmune disorder.

26. The method of claim 21, wherein the T-cell-mediated disorder is a transplant rejection.

27. The method of claim 24, wherein the cancer is a leukemia, a lymphoma, or a myeloma.

28. The method of claim 24, wherein the cancer is an acute myelocytic leukemia, an adult acute lymphocytic leukemia, a childhood acute lymphocytic leukemia, a chronic lymphocytic leukemia, a chronic myelocytic leukemia, a hairy cell leukemia, Hodgkins

disease, a myelodysplastic syndrome, a non-hodgkins lymphoma, an AIDS-related lymphoma, a cutaneous T-cell lymphoma, a Sezary leukemia, an acute myelogenous leukemia, or a B cell chronic lymphocytic leukemia.

29. A method of inhibiting the proliferation of a cell that expresses an IL-7 receptor, the method comprising

(a) providing a cell that expresses an IL-7 receptor, and

(b) exposing the cell to a composition comprising the polypeptide of claims 1, wherein the amount of the composition to which the cell is exposed is sufficient to inhibit the proliferation of the cell.

30. A method of diagnosing a patient as having a disease or condition that could be treated with a polypeptide of claims 1, the method comprising determining whether a biological sample obtained from the patient contains cells that are bound by a polypeptide comprising IL-7, the occurrence of binding indicating that the cells can be bound by the polypeptide of any of claims 1 *in vivo* and thereby inhibited from proliferating in response to wild-type IL-7 *in vivo*.

31. The polypeptide of claim 1, wherein the polypeptide effectively competes with wild type IL-7 for binding to a cell surface receptor.

32. The polypeptide of claim 1, wherein the polypeptide further comprises a heterologous sequence.

33. The polypeptide of claim 32, wherein the heterologous sequence comprises a sequence that increases the circulating half-life of the IL-7 portion of the polypeptide.